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Report No. APG-MT-3251

FINAL LETTER REPORT ON

INITIAL PRODUCTION TEST

OF

AIR CONDITIONER, 38,000 BTU/HR

BY

V. MORAWSKI

JUNE 1969

ABERDEEN PROVING GROUND

ABERDEEN PROVING GROUND, MARYLAND

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DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

AMSTE-GE 7 AUG 1969

SUBJECT: Final Letter Report on Initial Production Test of Air Conditioner, 38,000 BTU/HR, USATECOM Project No 7-7-0831-02 (7-EG-175-038-001)

Commanding General
U. S. Army Materiel Command
ATTN: AMCMR-C
Washington, D.C. 20315

1. Approval Statement. The subject final report is approved except as noted herein.

2. Background of Test.

a. The test item is an air-cooled environmental control unit designed for floor mounting and operates on 416-volt, 400-cycle, 3-phase, 4-wire power. It utilizes dichlorodifluoromethane refrigerant (R-12) and is electric-motor driven. The unit has a rated cooling capacity of 38,000 BTU/HR and a rated heating capacity of 35,000 BTU/HR. A remote-control box assembly contains the operating controls for the air conditioning unit. The control box contains a four-position switch (HEAT, OFF, VENT, COOL) and a temperature control variable resistor (minimum setting COOL; maximum setting HEAT). The rheostat dial is continuously variable between the COOL and WARM positions, which corresponds to a return air temperature range of +60°F to +90°F.

b. The subject initial production test was conducted at Aberdeen Proving Ground during the period 5 August 1968 through 13 May 1969. The purpose of the test was to determine conformance of the air conditioner to required specifications and suitability for release.

3. Test Results.

a. The subject final letter report does not classify any of the incidents or failures as defects or shortcomings; however, equipment performance reports were submitted which indicated the presence of eight deficiencies and seven shortcomings.

b. Paragraph 4 of the inclosed final letter report summarizes the results of test. The subject air conditioner met the test objectives for controls, road, sand and dust, endurance, reliability, and low-temperature storage tests.

c. Six of the equipment performance reports submitted as deficiencies are reclassified as follows:

(1) The unit failed to meet the performance test objectives because the current drawn in heating mode of operation was not within the specified current limits. Except for the current drawn in the heating mode of operation, the performance of both units was found to be satisfactory. The current drawn in the heating mode measured 1.4 amperes (average of three phases) lower than the minimum requirements. Inasmuch as the proper output was met, this is not considered a deficiency or shortcoming, but a manufacturer's design problem.

(2) Except for a malfunctioning circuit breaker, the unit was found to be free of mechanical and electrical safety hazards. Of the three electrical circuit breakers tested, two breakers were found to trip within nine seconds after application of the rated must-trip current. The remaining breaker began to burn after applying the load for two minutes. Inasmuch as the three circuit breakers tested were of the same design, the single breaker failure reported as a deficiency on the equipment performance report is reclassified as a random failure.

(3) Initial operation of the test item at ambient temperature of +125°F resulted in activation of the high-pressure cutout switch which de-energized the condenser fan and compressor motors. With guidance from U. S. Army Mobility Equipment Research and Development Center (USAMERDC), the operating point of the high-pressure cutout switch was reset. After resetting the operation point, the test item started without difficulty and performed satisfactorily throughout the high temperature run. The deficiency as reported by the equipment performance report is reclassified as a corrected deficiency. Instructions should be incorporated in the technical manual indicating the correct setting of the cutout switch.

(4) The test item, when operated in the cooling mode, produced conducted noise levels in excess of the permissible limits outlined in MIL-E-55301. Investigation revealed that the noise was generated within plug P-108, as a result of salt residues from the salt-fog test previously conducted. After flushing the plug free of contaminants, the unit displayed noise levels that were within specified limits. Therefore, this deficiency is considered a shortcoming.

(5) Attempted initial operation of the air conditioner, prior to conducting the capacity test, showed the unit to be inoperable. Investigation revealed that the refrigerant solenoid coil was internally shorted. The shorted condition, reported as a deficiency on the equipment performance report, is considered a quality control problem.

(6) After exposure to salt-fog, the unit was found to be inoperable in the cooling mode. The equipment performance, reported as a deficiency, is reclassified as a shortcoming.

d. The remaining two deficiencies, reported by equipment performance reports, are as follows:

(1) After exposure to humidity, the fresh air inlet damper assembly was inoperative.

(2) The unit failed to meet the laboratory vibration test objective due to damage which occurred during testing in the vertical plane.

e. The seven shortcomings are as follows:

(1) The technical manuals were not initially provided for both test units.

(2) The control panel cover plate of unit No 0157 was missing when the unit was received for test.

(3) The control box cable-covering (spaghetti) was unable to withstand movement without being damaged.

(4) The evaporator and condenser filter clean indicators broke free of their respective cover panels.

(5) Inadequate caulking on the left side of the condensate collection tray, surrounding the base of the evaporator blower assembly, permitted water to blow to the forward portion of the recirculating air-inlet compartment.

(6) The insulating material on the back of the rear-evaporator removable-panel became completely detached after exposure to humidity.

f. The remaining shortcoming, which indicated that light rust had formed on the evaporator fan motor shaft after exposure to salt-fog, is reclassified for information only.

g. General maintainability of the subject unit is satisfactory and the subject unit is safe to operate.

4. Comments.

a. The total net cooling capacity of the subject air conditioner was found to exceed the minimum specified requirements (35,000 BTU/HR) by 5130 BTU/HR.

b. In the absence of a prescribed mission performance, an assumed 24-hour mission, computed at a .90 confidence level, indicates that the mean time between failures is at least 207 hours. However, confidence level is totally dependent on the mission. The corresponding reliability at the same confidence level is at least .89. The above computations are based on a test duration of 505 hours of operation.

c. Plug P-108, upon insertion into J-108, assumes a position which directs the open end of the rubber strain relief sleeve directly toward the top of the unit, thereby permitting any condensation or precipitation to be funneled into the plug. Inasmuch as plug P-108 carries the control signals for energizing the condenser fan and compressor motors, plug P-108 should be repositioned so as to eliminate water buildup within the plug.

5. Conclusions.

a. The subject air conditioner is unsuitable for release until all deficiencies and as many shortcomings as feasible are corrected.

b. Reliability and maintainability of the subject air conditioner are adequate.

c. The subject unit is safe to operate.

6. Recommendations.

a. Instructions should be incorporated in the technical manual for setting the high pressure switch cutout at 300 psi, provided other operation parameters of the test item are not adversely affected.

AMSTE-GE 7 AUG 1969

SUBJECT: Final Letter Report on Initial Production Test of Air Conditioner, 38,000 BTU/HR, USATECOM Project No 7-7-0831-02 (7-EG-175-038-001)

b. Replacement of the control box cable covering with a material capable of withstanding movement at -65°F without damage.

c. Repositioning of plug P-108 to eliminate water buildup within the plug.

d. Modifications of the evaporator and condenser filter-clean-indicators by means of rivets or screws in place of the adhesive presently used.

e. The materials or tolerances between the fresh air control-knob shaft and tapped bushing be changed to insure free operation after the required environmental exposures.

FOR THE COMMANDER:

WILLIAM H. HUBBARD
Colonel, GS
Deputy Chief of Staff

1 Incl
Final Rept 7-7-0831-02

DEPARTMENT OF THE ARMY
ABERDEEN PROVING GROUND
ABERDEEN PROVING GROUND, MARYLAND 21005

Mr. Morawski/lt/234-3350-2817

STEAP-MT-TF

07 JUN 19[illegible]

SUBJECT: Final Letter Report On Initial Production Test of Air Conditioner, 38,000 BTU/HR, Report No. APG-MT-3251, USATECOM Project No. 7-7-0831-02

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Commanding General
US Army Mobility Equipment Command
ATTN: AMSME-QRT
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1. REFERENCES

a. Letter, AMSME-GE, USATECOM, 1 March 1967, Test Directive, USATECOM Project No. 7-7-0831-02, Initial Production Test of Air Conditioner, 38,000 BTU/HR, DA 23-195-AMC-01174(T), MIL-A-52195A, FSN 4120-926-4280.

b. Test Plan, 3 January 1967, from CMEFB-RDE-KC, Recommended Initial Production Tests for 38,000 BTU/HR Air Conditioner.

c. Letter Report, STEAP-DS-TF, APG, 24 April 1968, Letter Report of Preproduction Test of Air Conditioner, 38,000 BUT/HR, 416-Volt, 400-Cycle, 3-Phase, per MIL-A-52195A (Modified), Contract No. DA-23-195-AMC-01174(T), USATECOM Project No. 7-7-0831-01, Report No. DPS-2746.

d. Test Outline, 7 December 1966, from CMEFB-RDE-KC, Test Outline for 38,000 BUT/HR Air Conditioner.

e. US Army Test and Evaluation Command Material Test Procedure, TECP 700-700, Interim Pamphlet 70-73, 8 March 1967, Laboratory Vibration Tests.

f. Electrical Testing Laboratories, Inc., Report No. 407730, 31 March 1969, Cooling-Capacity Test of a 38,000 BUT/HR, 416-Volt, 3 Phase, 400-Hertz Air Conditioner, MERDC Reference No. CH401, Serial No. 0174.

STEAP-MT-TF
SUBJECT: Final Letter Report On Initial Production Test of Air Conditioner, 38,000 BTU/HR, Report No. APG-MT-3251, USATECOM Project No. 7-7-0831-02

2. BACKGROUND

Aberdeen Proving Ground (APG) was directed by letter from US Army Test and Evaluation Command (USATECOM) (Inclosure 3) to conduct the tests requested by the US Army Mobility Equipment Command (USAMECOM) and any additional tests recommended to insure compliance with the provisions of AMCR 700-34. Additional tests recommended by APG were the capacity, safety evaluation, high-temperature, low-temperature, salt fog, humidity, radio-interference suppression, sand and dust, rain, laboratory vibration, and endurance tests. In August 1968, two 38,000 Btu/hr air conditioners (serial Nos. 0157 and 0174) were received at APG for the initial production test.

The test item is an air-cooled environmental control unit designed for floor mounting and operates on 416-volt, 400-cycle, 3-phase, 4-wire power. It utilizes dichlorodifluoromethane refrigerant (R-12) and is electric-motor driven. The unit has a rated cooling capacity of 38,000 Btu/hr and a rated heating capacity of 35,000 Btu/hr. A remote-control box assembly contains the operating controls for the air conditioning unit. The control box contains a four-position switch (HEAT, OFF, VENT, COOL) and a temperature control variable resistor (minimum setting COOL; maximum setting HEAT). The rheostat dial is continuously variable between the COOL and WARM positions, which corresponds to a return air temperature range of +60°F to +90°F.

This report summarizes the initial production test of the 38,000 Btu/hr air conditioner. The purpose of the test was to determine conformance of the air conditioner to required performance characteristics. The test was conducted at APG from 5 August 1968 to 13 May 1969.

3. OBJECTIVES

The test objectives were:

a. To provide specified initial production test data on the air conditioner for the developer in conjunction with contractural requirements.

b. To provide USATECOM with test data on the additional recommended tests.

4. SUMMARY OF RESULTS

4.1 Examination

The technical manuals of both units and the control panel cover plate of unit No. 0157 were missing when the units were received for test. Workmanship of both units was found to be satisfactory and there was no evidence of damage.

4.2 Controls Test

The controls of both units were found to operate satisfactorily.

4.3 Performance Test

Except for the current drawn in the heating mode of operation, the performance of both units was found to be satisfactory. The current drawn in the heating mode measured 1.4 amperes (average of three phases) lower than the minimum requirement. Three identical units, tested at APG, drew the same current in the heating mode of operation, thereby raising questions as to the realism of the established criterion.

4.4 Road Test

The air conditioner (No. 0174) satisfactorily withstood 300 miles of cross-country travel without damage.

4.5 Reliability Test

The air conditioner (No. 0174) performed satisfactorily throughout 53 hours of operation without damage or degradation in unit performance.

4.6 Safety Evaluation

Except for a malfunctioning circuit breaker, unit No. 0157 was found to be free of mechanical and electrical safety hazards.

Of the three electrical circuit breakers tested, two breakers were found to trip within 9 seconds after application of the rated must-trip current. The remaining breaker began to burn after applying the load for two minutes. This was evidenced by the emission of smoke from the breaker housing. Since the three circuit breakers tested were identical, the single circuit breaker failure was considered a random failure.

4.7 High-Temperature Test

Initial operation of unit No. 0157 at an ambient temperature of +125°F resulted in activation of the high-pressure cutout switch which de-energized the condenser fan and compressor motors.

Upon direction from US Army Mobility Equipment Research and Development Center (USAMERDC), the operating point of the high-pressure cutout switch was reset. After resetting the operating point the test item started without difficulty and performed satisfactorily throughout the high-temperature run.

4.8 Low-Temperature Storage Test

Unit No. 0157 satisfactorily withstood 72 hours storage at -65°F without damage or degradation in performance.

4.9 Low-Temperature Operational Test

During operation of unit No. 0157 at -65°F, the control box cable-covering (spaghetti) split when moved. The covering was found to be extremely brittle at the low-temperature condition. Performance of the unit in the heating mode of operation was found to be satisfactory.

4.10 Salt-Fog Test

Light rust was found on the evaporator fan motor shaft of both units after 48 hours exposure to salt-fog. The rust was easily wiped free of the shafts and no signs of shaft pitting was evident.

After exposure to salt-fog, unit No. 0174 was found to be inoperable in the cooling mode. The inoperable condition was believed to have been caused by a short circuit in plug P-108 resulting from a salt solution build-up within the plug.

Operation of unit No. 0157 after the salt-fog exposure was satisfactory.

4.11 Humidity Test

Unit No. 0174 underwent the humidity test.

Examination of the test item, after exposure to humidity, revealed the following:

a. The insulating material on the back of the rear-evaporator removable panel became completely detached. Investigation showed that the adhesive was sparingly applied, thus resulting in poor bonding.

b. The fresh air inlet damper assembly was inoperative. Investigation revealed that the threaded shaft (to which the damper control knob was applied) was bound-up in the large tapped bushing. The binding was believed to be a result of a combination of salt deposits remaining from the previously conducted salt-fog test and the corrosive effects added during the humidity exposure.

4.12 Sand and Dust Test

Unit No. 0174 displayed satisfactory performance during operation in a simulated sand - dusty environment.

4.13 Rain Test

This test was conducted on unit No. 0174.

After 1 hour of operation in the ventilating mode, water was observed entering the test van through the air conditioner and was being deposited on the floor. The water was found entering the van at the bottom of the evaporator recirculating air screen. Investigation revealed that inadequate caulking on the left side of the condensate collection tray, surrounding the base of the evaporator blower assembly, permitted water to flow to the forward portion of the recirculating air-inlet compartment and onto the floor of the van.

4.14 Radio-Interference Suppression Test

This test was conducted on unit No. 0174.

The test item, when operated in the cooling mode, produced conducted noise levels in excess of the permissible limits outlined in MIL-E-55301. Investigation revealed that the noise was apparently being generated within plug P-108, as a result of salt residues from the salt-fog test previously conducted. After flushing the plug free of contaminants, the unit then displayed noise levels that were within specified limits.

4.15 Laboratory Vibration Test

This test was conducted on unit No. 0157.

Damage to the air conditioner occurred only during testing in the vertical plane. The damage was as follows:

a. A broken welded joint at the junction where the refrigerant line from the charge valve connected to the suction line of the compressor.

b. The evaporator and condenser filter-clean-indicators broke free of their respective cover panels.

4.16 Endurance Test

The air conditioner (No. 0157) demonstrated satisfactory performance throughout 401 hours operation in the cooling mode and 104 hours operation in the heating mode.

4.17 Cooling Capacity Test

This test was conducted in unit No. 0174. The total net cooling capacity of the air conditioner was found to exceed the minimum specified requirement by 5130 Btu/hr.

An operational checkout of the unit prior to conducting the capacity test uncovered a short circuit in the refrigerant line solenoid valve. Since the identical make and model valve has been used for approximately 7 years in the HAWK and Pershing missile systems, without a reported failure, the shorted condition was considered a random failure.

5. CONCLUSIONS

It is concluded that the air conditioner met the test objectives of all the tests except for the following:

a. The unit failed to meet the examination test objective because the technical manuals for both units and a control panel cover plate on unit No. 0157 were not supplied.

b. The unit failed to meet the performance test objective because the current drawn in heating mode of operation was not within the specified current limits. However, it is also concluded that the established criterion is unrealistic.

c. The unit failed to meet the safety evaluation test objective as a result of a malfunctioning circuit breaker.

d. The unit failed to meet the high-temperature test objective because of the established setting of the high-temperature cutout.

e. The unit failed to meet the low-temperature test objective because the control box cable-covering (spaghetti) was unable to withstand movement without being damaged.

f. The unit failed to meet the salt-fog test objective as a result of the inoperable condition (in the cooling mode) believed to have been caused by salt deposits shorting plug P-108.

g. The unit failed to meet the humidity test objective because of inadequate bonding of the evaporator panel insulating material and binding of the fresh air inlet damper control.

h. The unit failed to meet the rain test objective as a result of inadequate caulking of the condensate collection tray.

i. The unit failed to meet the laboratory vibration test objective as a result of a broken welded joint of the refrigerant line and broken evaporator and condenser filter-clean-indicators.

6. RECOMMENDATIONS

Not applicable.

FOR THE COMMANDER:

R. P. WITT
Associate Director
Materiel Test Directorate

3 Incls
1. Details of Test
2. Test Data
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DETAILS OF TEST

1. EXAMINATION

1.1 Objectives

The objectives were:

a. To determine if the test item was free of the defects outlined in attachment 1 of the test plan (Reference b).

b. To determine if the spare parts, accessories, and technical manuals specified in the contract were furnished.

1.2 Criterion

The presence of one or more of the following defects shall constitute failure of the test item to meet requirements:

a. Accessories, power supply plug, manuals, or other components specified in contract or order not furnished.

b. Evidence of exterior or interior damage incurred prior to or during shipment.

c. Installation mounting nuts missing or not accessible because of panel interference.

d. Paint flaking, blistering, peeling, or not smoothly applied.

e. Panel fasteners missing or will not work.

f. Metal shavings or other foreign material inside unit.

g. Fresh air intake damper assembly not free and operating as specified.

h. Evidence of refrigerant or oil leaks.

i. Component mountings not secure.

j. Refrigerant piping not secure and/or clamps missing.

k. Electrical connections not secure, wires abraded or broken, wires not identified and marked.

l. Gasketing and insulation not secure.

m. Fans binding or contacting housings or other components.

1.3 Method

Both units, Nos. 0157 and 0174, were examined.

The cover panels of the test item were removed. The test item was then examined for workmanship, refrigerant leaks, and missing or damaged components.

1.4 Results

Examination of the test items showed the technical manuals of both units and the control panel cover plate of unit No. 0157 to be missing.

Workmanship of the test items was found to be satisfactory and there was no evidence of refrigerant leaks or damaged components.

1.5 Analysis

Except for the missing technical manuals and control panel cover plate, the units met the examination criterion.

2. CONTROLS TEST

2.1 Objective

The objective was to determine if the controls of the test item operated as specified in attachment 5 of Reference b.

2.2 Criterion

Inability of the mode selector switch, condenser fan door switch, high - low pressure cutout switches, time delay control, temperature-overheat switch, phase sequence relay, and temperature control system to operate as outlined in attachment 5 of the test plan shall constitute failure of this test.

2.3 Method

This test was conducted on both units, Nos. 0157 and 0174.

Sheet-metal ducts were installed on the evaporator return-air inlet and evaporator air-discharge opening. Each duct was 24 inches long and of the same cross-sectional dimension as the respective opening. Two thermocouples were placed in each duct. The thermocouples were

located 18 inches from the air conditioner openings and were equally spaced over the cross section of the ducts to give average evaporator intake - and discharge-air temperatures.

The mode selector switch was set, in turn, to each of its four operating positions with power applied to the test item through a test console. Thermocouples and Bourdan gages were used to indicate critical temperatures and pressures.

Required water temperatures for immersion of the thermostat bulb were maintained using an electric heater and dry ice.

Operational performance of the various controls was determined by observing the current drawn by the test items and the critical temperatures resulting from the operations outlined in attachment 5 of Reference b.

2.4 Results

Performance of the controls test yielded the following results:

a. Mode Selector Switch. With this switch in the OFF position, all components were de-energized and inoperative. With the switch in the VENT position only the evaporator fan was operating. When the switch was turned to the COOL position, first, the evaporator and condenser fan motors energized and then the compressor motor. Two repetitions of the above operations produced the same results.

b. Temperature Control System. While operating in the cooling mode, with the thermostat bulb immersed in +38°F water and the temperature control rotated from the maximum COOL to the maximum WARM position; the solenoid liquid valve closed, the hot gas bypass opened up at approximately 37 psig and the thermo-valve allowed a flow of refrigerant to the compressor suction. While operating in the heating mode, with the thermostat bulb in +41°F water and the thermostat control set to the maximum WARM position, the units drew 17.6 amperes (average of phases) and the evaporator air stream temperatures rose rapidly, indicating that the heaters were fully energized. With the thermostat bulb immersed in +107°F water and the thermostat control rotated to the maximum COOL position, the units drew 4 amperes (average of phases) and the evaporator air stream temperature remained stable, indicating that the heaters were de-energized. The above results were as specified in the test plan.

c. Condenser Fan Door Switch. While operating in the cooling mode the condenser fan door was closed. Closure of the door caused the compressor and the condenser fan motor to become de-energized, which was as specified in the test plan.

d. High-Pressure Cutout Switch. With the units operating in the cooling mode, the condenser air inlet was blocked. When the compressor discharge pressure reached 265 psig, the condenser fan and compressor stopped. This pressure was within the 250 to 270 psig range specified in the test plan.

e. Low-Pressure Cutout Switch. While the units were operating in the cooling mode, the refrigerant was slowly bled from the units. When the suction pressure was reduced to 22 psig, the low-pressure cutout stopped the compressor and condenser fan. Refrigerant was reintroduced to the units while depressing the SYSTEM RESET button. When the pressure rose to 33 psig for unit No. 0157 and 32 psig for unit No. 174, the pressure switch actuated and the units restarted. The cut-in and cut-out pressures of both units were within the range setting specified in the test plan.

f. Temperature Overheat Switch. The units were operated in the heating mode for 15 minutes after which the evaporator fan motor was de-energized (by disconnecting plug P-107) and the compartment temperature allowed to rise. Within 1 minute after the evaporator fan was de-energized, the overheat switch de-energized the heaters. The test plan only required that the switch operate.

g. Time Delay Control. The time delay between the condenser fan motor coming on and the compressor coming on was found to be 3.2 seconds. This was within the 3 seconds ± 10% specified in the test plan.

h. Phase Sequence Relay. The power was connected to the units with two phases reversed from their proper sequence and attempts were made to operate the units. The units were found to remain de-energized in every position of the mode selector switch. This indicated that the phase sequence relay was disabling the units as required by the test plan.

2.5 Analysis

The test items met the controls test criterion.

3. PERFORMANCE TEST

3.1 Objective

The objective was to determine if the test item met the requirements of attachment 2 of Reference b when operated in the maximum cooling and heating modes.

3.2 Criterion

Any one of the following shall constitute failure of the test item to meet requirements:

a. Failure to operate.

b. Abnormal operation.

c. Low refrigerant charge.

d. Air temperature drop less than -26°F between evaporator inlet and outlet.

e. Power drawn on cooling cycle more than 12 kw with a power factor of at least 0.75.

f. Current drawn on heating cycle not between 19 and 21 amperes (average of three phases).

3.3 Method

This test was conducted on both units, Nos. 0157 and 0174.

The test was conducted in a shop area using the sheet-metal ducts and thermocouples in the manner described in paragraph 2.3. With power connected to the test item through a test console, the test item was operated for 2 hours in the cooling mode and 1/2 hour in the heating mode. During the 2-1/2 hour operating period, power characteristics, refrigerant pressures, and intake and discharge air temperatures were recorded.

3.4 Results

The test item operated satisfactorily throughout the 2-1/2 hour operating period.

The operational characteristics measured were as shown in Table 3-I.

Table 3-I. Operational Characteristics

	Modes of Operation			
	Unit No. 0174		Unit No. 0157	
	Cooling	Heating	Cooling	Heating
Input, volts				
Phase A to neutral	240	240	240	240
Phase B to neutral	240	240	240	240
Phase C to neutral	240	240	240	240
Current, amperes				
Phase A	18.4	17.6	19.4	17.5
Phase B	17.4	17.3	18.9	17.3
Phase C	18.5	17.9	19.4	17.6
Power, kw				
Phase A	3.4	4.2	3.6	4.2
Phase B	3.4	4.2	3.4	4.2
Phase C	3.4	4.3	3.6	4.3
Evaporator air intake temperature, °F	90	-	89	-
Evaporator air discharge temperature, °F	60	-	61	-
Condenser air intake temperature, °F	89	-	89	-
Condenser air discharge temperature, °F	107	-	106	-
Refrigerant pressures, psig				
Suction	41	-	42	-
Discharge	150	-	150	-
Refrigerant sight glass	Clear	-	Clear	-
Power factor, %	78.3	-	76.5	-

3.5 Analysis

Except for the current drawn in the heating mode of operation; the air conditioners met the performance test criteria.

The current drawn in the heating mode measured 1.4 amperes (average of three phases) lower than the minimum requirement.

Three units, Nos. 0157 and 0174 covered in this report and No. 0004 previously tested at APG (Reference c), produced identical results. All three units drew 17.6 amperes (average of three phases) when operated in the heating mode. The heating capacity, calculated from the electrical power dissipated when drawing 17.6 amperes (average of three phases), is 43,000 Btu/hr. This capacity far exceeds the rated capacity of the unit (35,000 Btu/hr) as stipulated in the technical manual.

Based on these results, it is believed that the established criterion (paragraph 3.2) is in error.

The criterion should be re-established to reflect more realistic limits of current for the heating mode of operation.

4. ROAD TEST

4.1 Objective

The objective was to determine if the test item met the road-test requirements of attachment 3 of Reference b when subjected to 300 miles of cross-country travel.

4.2 Criteria

See paragraphs 1.2, 2.2, and 3.2.

4.3 Method

This test was conducted on unit No. 0174.

The air conditioner was mounted on a fabricated steel fixture by means of the eight mounting holes provided in the bottom and three mounting holes provided on each side of the test item. No auxiliary bracing or tiedowns were utilized.

The fixture was then bolted to the bed of an M35 test vehicle.

The test vehicle was operated for 300 miles over the No. 1 Parryman cross-country test course at APG.

After completion of the total test mileage, the examination (paragraph 1.3), controls test (paragraph 2.3), and performance test (paragraph 3.3) were performed.

4.4 Results

Examination of the test item showed no evidence of damage resulting from the road test.

The results of the controls test were found to be the same as reported in paragraph 2.4.

The results of the post road performance test are presented in Table 4-I.

Table 4-I. Post Road Operational Characteristics,
Unit No. 0174

	Modes of Operating	
	Cooling	Heating
Input, volts		
Phase A to neutral	240	240
Phase B to neutral	240	240
Phase C to neutral	240	240
Current, amperes		
Phase A	17.7	17.6
Phase B	17.2	17.4
Phase C	17.7	17.9
Power, kw		
Phase A	3.2	4.2
Phase B	3.1	4.2
Phase C	3.2	4.3
Evaporator air intake temperature, °F	78	-
Evaporator air discharge temperature, °F	52	-
Condenser air intake temperature, °F	76	-
Condenser air discharge temperature, °F	89	-
Refrigerant pressures, psig		
Suction	33.5	-
Discharge	115	-
Refrigerant sight glass	Clear	-
Power factor, %	75.2	-

4.5 Analysis

The test item met the road test criteria.

5. RELIABILITY TEST

5.1 Objective

The objective was to determine if the test item met the requirements of attachment 5 of Reference b when operated 50 hours in the cooling mode and 8 hours in the heating mode.

5.2 Criterion

Any of the following shall constitute failure of the test item to meet requirements:

a. Failure of any components or fracture or breakdown of any material.

b. Evidence of leakage of refrigerant.

c. Need for servicing during operation.

d. Abnormal operation.

e. Air temperature drop less than -26°F between evaporator inlet and outlet.

f. Power drawn on cooling cycle more than 12 kw with a power factor of at least 0.75.

g. Current drawn on heating cycle not between 19 and 21 amperes (average of three phases).

5.3 Method

This test was conducted on unit No. 0174.

The test was conducted in a shop area using the sheet-metal ducts and thermocouples in the manner described in paragraph 2.3. With power connected to the test item through a test console, the test item was operated for 50 hours in the cooling mode in cyclic operation of 50 minutes ON and 10 minutes OFF. The test item was then operated for 8 hours in the heating mode in cyclic operation of 55 minutes ON and 5 minutes OFF. Cycling operation was controlled by an electric timer which operated a contactor relay that was placed in the power line of the test item. During the 58-hour operating period, the operational requirements were checked at 4-hour intervals in the following specified manner:

a. Examined the refrigerant sight glass and recorded refrigerant pressures to ascertain that the test item remained fully charged.

b. Examined the test item for abnormal operations.

c. Recorded evaporator-intake and discharge-air temperatures to ascertain that the intake-to-discharge temperature drop was was at least -26°F.

d. Recorded input-power parameters to ascertain that power drawn in the cooling mode was less than 12 kw with a power factor of at least 0.75 and that the current drawn in the heating mode was between 19 and 21 amperes (average of three phases).

5.4 Results

The test item operated satisfactorily throughout the 58-hour operating period.

The operational characteristics measured were as shown in Table 5-I.

Table 5-I. Reliability Test Operational Characteristics, Unit No. 0174

Hours Into Test Run	Voltage Each Phase To Neutral	Phase Current, amperes			Phase Power, kw			Power Factor, %	Air Temperature, °F				Pressure, psig	
									Evaporator		Condenser			
		A	B	C	A	B	C		In	Out	In	Out	Low	High
Cooling Mode Operation														
4	240	17.6	17.1	17.7	3.2	3.1	3.2	75.5	77	50	77	90	33	110
8	240	17.9	17.4	17.9	3.2	3.1	3.2	75.0	79	51	79	92	33.5	115
12	240	17.6	17.3	17.8	3.2	3.1	3.2	75.1	78	51	76	89	34	113
16	240	17.7	17.3	18.0	3.2	3.1	3.2	75.0	79	52	79	91	33	112
20	240	17.6	17.4	18.0	3.2	3.1	3.3	75.5	78	52	78	92	34.5	117
24	240	17.8	17.5	18.0	3.2	3.1	3.3	75.0	80	54	79	93	35	120
28	240	18.1	17.6	18.3	3.3	3.2	3.3	75.6	81	55	81	97	37	130
32	240	18.1	17.8	18.4	3.3	3.2	3.4	76.0	82	55	83	99	36	130
36	240	18.3	17.8	18.5	3.3	3.2	3.4	75.5	82	55	82	98	36	130
40	240	18.1	17.8	18.5	3.3	3.2	3.4	75.8	81	55	82	98	36	130
44	240	18.3	17.9	18.5	3.3	3.3	3.4	76.2	83	55	84	100	37	135
48	240	18.4	18.0	18.6	3.4	3.3	3.4	76.5	85	55	85	101	37	138
50	240	18.1	17.6	18.5	3.3	3.2	3.4	76.0	80	55	80	97	37	130
Heating Mode Operation														
2	240	17.8	17.5	18.0	4.3	4.2	4.3	-	79	140	-	-	-	-
4	240	17.6	17.4	18.0	4.2	4.2	4.3	-	78	133	-	-	-	-
8	240	17.6	17.4	17.9	4.2	4.2	4.3	-	78	138	-	-	-	-

5.5 Analysis

The test item met the reliability test criterion.

Although the current drawn in the heating mode measured 1.4 amperes (average of three phases) lower than the minimum requirement, based on the analysis of results obtained during the performance test (paragraph 3.5), the test item was considered to have met the reliability test criterion.

6. SAFETY EVALUATION TEST

6.1 Objective

The objective was to determine if the test item was safe for its intended use and that safety features had been incorporated and were functional.

6.2 Criteria

The criteria are as follows:

a. Unit shall be safe to operate and maintain.

b. Unit shall have automatic safety controls to protect against overpressures, overheating, and electrical overcurrents.

6.3 Method

This test was conducted on unit No. 0157.

The test item was inspected for any inadequacy of protective devices that would cause injury to personnel during normal repair or service. In addition, any electrical shock hazards or other safety factors which would result in injury to personnel were determined.

Operation of the automatic safety controls were determined as follows:

a. High-Pressure Cutout Switch. A pressure gage was connected to the high pressure refrigerant line of the test item. The test item was then operated in the cooling mode and the condenser air flow was restricted until the high-pressure cutout switch operated. This test was repeated three times and the refrigerant pressures at which the cutout switch operated were recorded.

b. Temperature Overheating Switch. While operating in the heating mode, the overheating switch was forced to operate by de-energizing the evaporator blower motor. An ammeter measuring power input current was used to indicate operation of the cutout. This test was repeated three times.

c. Electric Overcurrent. The circuit breakers were removed from the air conditioner and bench tested to determine conformance to the specified must-trip current rating. With 240 volts applied, an electrical load was selected to subject each breaker to the rated must-trip current (65 amperes). The trip current of each breaker was checked three times by clocking the time delayed from initial power turn-on to breaker trip time.

6.4 Results

Except for a malfunctioning circuit breaker, the air conditioner was found to be free of mechanical and electrical safety hazards.

The air conditioner contained a high-pressure cutout switch, temperature overheating switch, and three overcurrent circuit breakers.

The high-pressure cutout switch operated at a refrigerant pressure of 265 psig (paragraph 2.4d).

The overheating switch was found to operate within 1 minute after de-energizing the evaporator blower motor (paragraph 2.4f).

Of the three electrical circuit breakers tested, two breakers were found to trip within 9 seconds after application of the rated must-trip current. The remaining breaker failed to trip. The faulty breaker began to burn after applying the load for 2 minutes. This was evidenced by the emission of smoke from the breaker housing.

6.5 Analysis

Except for malfunction of the electrical circuit breaker, the test item met the safety evaluation test criteria.

Since the three circuit breakers tested were identical, the single circuit breaker failure is believed to be a random type failure rather than a design deficiency.

7. HIGH-TEMPERATURE TEST

7.1 Objective

The objective was to determine if the test item operated as required under the high-temperature conditions specified in the test outline (Reference d).

7.2 Criterion

Inability of the air conditioner to start, operate, and restart, or any evidence of deterioration, corrosion, damage, or loss of refrigerant shall constitute failure of this test.

7.3 Method

This test was conducted on unit No. 0157.

The test item was placed in a climatic chamber and exposed to an ambient temperature of +155°F for 8 hours. The chamber temperature was then reduced to +125°F and the test item was energized in the cooling mode and allowed to operate for 1 hour. After the 1-hour operating period, the test item was turned off for 15 minutes and then restarted. After restarting, the test item was allowed to operate for an additional 15 minutes.

During operation at +125°F, the evaporator and condenser intake- and discharge-air temperatures and refrigerant pressures were measured at 15-minute intervals.

After the high-temperature exposure the test item was examined for damage.

7.4 Results

Initial operation of the test item at an ambient temperature of +125°F (after 8-hour soak at +155°F) resulted in activation of the high-pressure cutout switch which de-energized the condenser fan and compressor motors.

Upon direction from USAMERDC, the high-pressure cutout indicated operating point was reset from 275 psig to 300 psig. The controls subtest (paragraph 2.4), conducted prior to this test, revealed that the cutout actually functioned at 265 psig and was within its specified operating range (250 to 270 psig).

After resetting the operating point, the test item started without difficulty. The maximum refrigerant discharge pressure reached after start-up was 295 psig.

Operational air temperatures and refrigerant pressures measured throughout the high-temperature test run are presented in Table 7-I.

Table 7-I. High-Temperature Operational Characteristics, Unit No. 0157

	Time into Test Run				15 Min after Restart
	15 Min	30 Min	45 Min	60 Min	
Evaporator air intake temperature, °F	126	125	126	126	125
Evaporator air discharge temperature, °F	99	99	100	100	100
Condenser air discharge temperature, °F	145	145	146	146	145
Refrigerant suction pressure, psig	60	62	62	62	61
Refrigerant discharge pressure, psig	245	248	250	250	250

Examination of the unit, following high-temperature exposure, showed no evidence of damage.

7.5 Analysis

Except for activation of the high-pressure cutout, which prevented operation at +125°F (paragraph 7.4), the test item met the high-temperature test criterion.

The high-pressure cutout setting should be re-established to 300 psig.

8. LOW-TEMPERATURE STORAGE TEST

8.1 Objective

The objective was to determine if the test item incurred damage when exposed to the low-temperature storage conditions specified in Reference d.

8.2 Criterion

Any evidence of deterioration or damage or inability of the air conditioner to start and operate shall constitute failure of this test.

8.3 Method

This test was conducted on unit, No. 0157.

The test item was placed in a climatic chamber and stored at an ambient temperature of -65°F for 72 hours. At the conclusion of the storage period, the chamber temperature was allowed to rise to +80°F over a period of 16 hours. The test item was then examined for damage and operated for 1 hour in the cooling mode and 15 minutes in the heating mode.

8.4 Results

Examination of the test item showed no evidence of damage resulting from the exposure. Operational characteristics of the unit measured after exposure to -65°F are presented in Table 8-I.

Table 8-I. Post Low-Temperature Storage Operational Characteristics, Unit No. 0157

	Modes of Operation	
	Cooling	Heating
Evaporator air intake temperature, °F	80	78
Evaporator air discharge temperature, °F	53	150
Condenser air intake temperature, °F	80	-
Condenser air discharge temperature, °F	88	-
Refrigerant suction pressure, psig	38	-
Refrigerant discharge pressure, psig	125	-

8.5 Analysis

The test item met the low-temperature storage test criterion.

9. LOW-TEMPERATURE OPERATIONAL TEST

9.1 Objective

The objective was to determine if the test item displayed satisfactory performance when operated at -65°F ± 3°F.

9.2 Criterion

Any damage resulting from operation or inability of the air conditioner to start, operate, and restart in the heating mode of operation shall constitute failure of this test.

9.3 Method

This test was conducted on unit No. 0157.

The test item was placed in a climatic chamber and the chamber temperature was adjusted to -65°F. The test item was then energized in the heating mode and allowed to operate for 1 hour. After the 1-hour operating period, the unit was turned off for 15 minutes and then restarted. After restarting, the unit was allowed to operate for an additional 15 minutes.

During operation at -65°F, the evaporator intake- and discharge-air temperatures were measured at 15-minute intervals.

9.4 Results

During operation of the test item at -65°F the control box cable covering (spaghetti) split when moved. The covering was found to be extremely brittle.

Operation of the unit at -65°F was found to be satisfactory. Operational air temperatures measured at the evaporator intake and discharge grilles were as shown in Table 9-I.

Table 9-I. Low Temperature Heater Operation, Unit No. 0157

	Time into Test Run				15 Min
	15 Min	30 Min	45 Min	60 Min	after Restart
Evaporator air intake temperature, °F	-58	-58	-58	-58	-58
Evaporator air discharge temperature, °F	-37	-35	-35	-35	-37

9.5 Analysis

Except for damage to the control box cable covering (spaghetti), the test item met the low temperature operational test criterion.

The cover material for the control box cable should be replaced with material capable of remaining pliable at the required low temperature.

10. SALT-FOG TEST

10.1 Objective

The objective was to determine if the test item satisfactorily withstood exposure to the salt-fog conditions specified in Reference d.

10.2 Criterion

Evidence of paint peeling, corrosion, refrigerant leaks, electrical shorts, or damaged or malfunctioning components shall constitute failure of this test.

10.3 Method

This test was conducted on units No. 0174 and 0157 in the order indicated.

The test items were placed in a salt-fog chamber which had been preheated to +95°F. The items were then subjected to a fine mist consisting of 5% (by weight) sodium chloride solution at a temperature of +92°F to +97°F for 48 hours.

At the conclusion of the exposure, the items were removed from the chamber and examined. After the examination, the controls test (paragraph 2.3) was conducted.

10.4 Results

10.4.1 Unit No. 0174. Examination of the test item, after 48 hours exposure to salt-fog, revealed that light rust had formed on the evaporator fan motor shaft. The rust was easily wiped free of the shaft and no signs of shaft pitting were evident.

Attempted operation of the test item showed the unit to be inoperable in the cooling mode. Operation in the ventilating and heating modes was satisfactory.

When operated in the cooling mode, the condenser fan and compressor motors remained de-engrgized. Trouble-shooting the control circuitry showed coil voltages of the condenser fan and compressor motor relays to be missing. In the process of continued trouble-shooting, disconnection of plug P-108 resulted in a considerable amount of water pouring from the rubber strain relief sleeve of the plug. Draining of the plug and a dry out period was permitted while the investigation continued. When no further evidence of component malfunction could be found plug P-108 was reinserted and operation of the test item was again attempted. With the test item energized in the cooling mode, all system components were now found to be energized and operating satisfactorily.

The results of the controls test were the same as reported in paragraph 2.4.

10.4.2 Unit No. 0157. Examination of the test item, after the salt-fog exposure, revealed that light rust had formed on the evaporator fan motor shaft. The rust was easily wiped free of the shaft and no signs of shaft pitting were evident. Operation of the unit was found to be satisfactory.

Except for the high-pressure cutout setting, the results of the controls test were the same as reported in paragraph 2.4. The high-pressure cutout was found to operate at 305 psig as opposed to 265 psig previously measured. The change in the cutout point resulted from resetting of the cutout during the high-temperature test (paragraph 7.4).

10.5 Analysis

Except for the inoperable condition of unit No. 0174 and the light rust formation on the evaporator fan motor shafts, resulting from exposure to salt-fog (paragraph 10.4), the test item met the salt-fog test criterion.

Plug P-108, upon insertion into J-108, assumes a position which directs the open end of the rubber strain relief sleeve directly towards the top of the unit, thereby permitting any condensation or precipitation that travels down the cable harness to be funneled into the plug. Since P-108 carries the control signals for energizing the condenser fan and compressor motors, it is believed that the salt solution build-up within the plug caused a short circuit. Plug P-108 should be repositioned so as to eliminate water build-up within the plug.

The rust that formed on the evaporator fan motor shaft was not considered detrimental to long term performance or maintainability of the test item. The shaft presently employed is considered adequate.

11. HUMIDITY TEST

11.1 Objective

The objective was to determine if the test item satisfactorily withstood exposure to the humidity conditions specified in Reference d.

11.2 Criterion

Evidence of paint peeling, corrosion, refrigerant leaks, electrical shorts, or damage or malfunctioning components shall constitute failures of this test.

11.3 Method

This test was conducted on unit No. 0174.

The test item was emplaced in a humidity test chamber. The chamber temperature and relative humidity were slowly raised to +155°F and 95% respectively, over a period of 2 hours. This condition was maintained for 6 hours. The chamber temperature was then gradually reduced to +80°F over a period of 16 hours; the relative humidity was maintained at 95%. This cycle was conducted ten times for a total exposure of 240 hours.

At the conclusion of the 240-hour exposure, the test item was removed from the chamber and a detailed examination was made. After the examination the test item was operated. All operating controls were checked and any evidence of improper unit operation was noted.

11.4 Results

Examination of the test item, after 240 hours exposure to humidity, revealed the following:

a. The insulating material on the back of the rear-evaporator removable panel became completely detached. Investigation showed that the adhesive was sparingly applied, thus resulting in poor bonding.

b. Attempted operation of the fresh air inlet damper showed the control knob to be immovable. Investigation revealed that the threaded shaft (to which the knob was affixed) was bound-up in the large tapped bushing. The binding was believed to be a result of a combination of salt deposits remaining from the previously conducted salt-fog test and the corrosive effects added during the humidity exposure. Constant flushing of the bushing (with an anticorrosive solution) and turning of the control knob with pliers, eventually freed the bound control.

Operation of the test item was found to be satisfactory. Operational characteristics after exposure to humidity are presented in Table 11-I.

Table 11-I. Post-Humidity Operational Characteristics, Unit No. 0174

	Modes of Operation	
	Cooling	Heating
Input, volts		
Phase A to neutral	240	240
Phase B to neutral	240	240
Phase C to neutral	240	240
Current, amperes		
Phase A	17.3	17.6
Phase B	16.7	17.5
Phase C	17.3	18.0
Power, kw		
Phase A	3.1	4.2
Phase B	3.0	4.2
Phase C	3.1	4.3
Evaporator air intake temperature, °F	73	74
Evaporator air discharge temperature, °F	46	140
Condenser air intake temperature, °F	73	-
Condenser air discharge temperature, °F	89	-
Refrigerant pressures, psig		
Suction	32.5	-
Discharge	105	-
Refrigerant sight glass	Clear	-
Power factor, %	75	-

11.5 Analysis

Except for poor bonding of the insulating material and binding of the fresh air damper control (paragraph 11.4), the test item met the humidity test criterion.

With regard to poor bonding of the insulating material, closer quality control measures should be taken.

Regarding binding of the fresh air damper control, the materials or tolerances between the fresh air control-knob shaft and tapped bushing should be changed to insure free operation after the required environmental exposures.

12. SAND AND DUST TEST

12.1 Objective

The objective was to determine if the test item would be undamaged and would function properly during and after exposure to sand and dust.

12.2 Criterion

Unit shall perform satisfactorily under applicable storage and operating climatic conditions established by AR 705-15, C-1, 14 October 1963.

12.3 Method

This test was conducted on unit No. 0174.

The test item was installed in the rear wall of a test van to simulate user application. The unit was mounted with the condenser section outside the van and the evaporator section inside the van. The unit was caulked and sealed at the wall of the test van.

A mixture of sand and dust containing particle sizes from very fine earth up to the largest size listed in AR 705-15, C-1, paragraph 7a(8) was blown at the condenser end at a wind speed of 15 mph. The air conditioner was exposed to these conditions for 4 hours with the unit operating in the cooling mode and the fresh air damper closed.

During the exposure, the test item and the inside of the van were observed for abnormal operation and evidence of sand and dust particles passing through the unit into the van.

After the exposure, the test item was examined and operated to determine if any damage or degradation in unit performance resulted from the exposure.

12.4 Results

The test item operated satisfactorily during and after the exposure and no evidence of damage was found.

The unit adequately prevented passage of sand and dust into the test van.

Operational characteristics of the unit, after the exposure, are presented in Table 12-I.

Table 12-I. Post Sand and Dust Test Operational Characteristics, Unit No. 0174

	Modes of Operation	
	Cooling	Heating
Input, volts		
Phase A to neutral	240	240
Phase B to neutra	240	240
Phase C to neutral	240	240
Current, amperes		
Phase A	17.7	17.6
Phase B	17.2	17.4
Phase C	17.7	17.9
Power, kw		
Phase A	3.2	4.2
Phase B	3.1	4.2
Phase C	3.2	4.3
Evaporator air intake temperature, °F	78	74
Evaporator air discharge temperature, °F	52	150
Condenser air intake temperature, °F	76	-
Condenser air discharge temperature, °F	89	-
Refrigerant pressures, psig		
Suction	33.5	-
Discharge	115	-
Refrigerant sight glass	Clear	-
Power factor, %	75.3	-

12.5 Analysis

The test item met the sand and dust test criterion.

13. RAIN TEST

13.1 Objective

The objective was to determine if the test item would operate properly during exposure to rainfall.

13.2 Criterion

Unit shall perform satisfactorily under applicable storage and operating climatic conditions established by AR 705-15, C-1, 14 October 1963.

13.3 Method

This test was conducted on unit No. 0174.

The test item was installed in the rear wall of a test van to simulate user application. The unit was mounted with the condenser section outside the van and the evaporator section inside the van. The unit was caulked and sealed at the wall of the test van.

A simulated rainfall averaging 6 inches per hour was then dispersed on the condenser side of the test item for a total exposure period of 4 hours.

During 2 hours of the total exposure period the test item was operated in the ventilating mode with the fresh air damper open. During the remaining 2-hour period the test item was operated in the cooling mode with the fresh air damper closed.

Throughout the exposure the test item was observed for abnormal operation and for evidence of water penetration into the test van.

13.4 Results

After 1 hour of operation in the ventilating mode, water was observed entering the test van through the air conditioner and was being deposited on the floor. The water was found entering the van at the bottom of the evaporator recirculating air screen. Investigation revealed that inadequate caulking on the left side of the condensate collection tray, surrounding the base of the evaporator blower assembly, permitted water to flow to the forward portion of the recirculating air-inlet compartment and onto the floor of the van.

Performance of the test item during 2 hours operation in the cooling mode was found to be satisfactory.

13.5 Analysis

The test item failed to meet the rain test criterion because of its inability to prevent water from entering the test van while operating in the ventilating mode (paragraph 13.4).

Regarding the inadequate caulking of the condensate collection tray, closer quality control measures should be taken.

14. RADIO INTERFERENCE SUPPRESSION TEST

14.1 Objective

The objective was to determine if the radio-frequency interference levels produced by the test item were within the allowable limits specified in MIL-E-55301(EL).

14.2 Criterion

The unit shall meet the radio-frequency interference requirements of MIL-E-55301 for tactical noncommunication electronic equipment.

14.3 Method

This test was conducted on unit No. 0174.

The air conditioner and test equipment were set up in an area with low ambient noise. The air conditioner was positioned on a ground plane equipped with Line Impedance Stabilization Networks Type FSR-702SC inserted in the power leads to the air conditioner. Test Receiver AN/URM-85 was used throughout the investigation to measure radiated and conducted interference.

Measurements of radiated interference were made over the frequency range from 0.15 through 1000 MHz with the antenna of the test equipment located 5 feet from the front of the air conditioner.

Measurements of conducted interference were made over the frequency range from 1.5 through 65 MHz.

Radiated and conducted interference measurements were made with the air conditioner operating in both the cooling and heating modes.

14.4 Results

The air conditioner, when operated in the cooling mode, was found to produce conducted noise levels in excess of the permissible limits outlined in MIL-E-55301. Investigation revealed that the noise was apparently being generated within plug P-108, as a result of salt residues from tests previously conducted. The air conditioner underwent

a 48-hour salt-fog test and a 240-hour humidity test (paragraphs 10. and 11.) prior to the radio-frequency suppression test. Plug P-108 was disassembled and flushed free of contaminants, using an appropriate cleaning agent. Cleaning of the plug eliminated the noise previously encountered and enabled the air conditioner to display noise levels that were within the specified limits.

The radiated energy levels of the air conditioner were unaffected by the salt residues contaminating plug P-108 and were found to be below the permissible limits.

The measured radiated and conducted energy levels of the air conditioner along with the allowable limits listed in the specification are presented on pages 1 and 2 of Inclosure 2.

14.5 Analysis

The test item failed to meet the test criterion because of excessive noise (conducted) which apparently was being generated from within plug P-108 as a result of salt residues originating during the salt-fog test.

Plug P-108 should be repositioned so as to eliminate any moisture build-up within the plug (paragraph 10.4).

15. LABORATORY VIBRATION TEST

15.1 Objective

The objective was to determine if the test item was capable of withstanding a laboratory vibration test without structural and component damage or degradation in performance.

15.2 Criteria

Criteria are as follows:

a. Unit shall be capable of withstanding transient conditions specified in paragraph 7.1 of AR 705-15, C-1.

b. Unit shall be designed to withstand, without damage, transport in military vehicles.

15.3 Method

This test was conducted on unit No. 0157.

The air conditioner was vibrated through each of its mutually perpendicular axes, i.e., vertical, longitudinal, and transverse in that order (see page 3 of Inclosure 2), and according to Reference e which defines the vibration schedule as follows:

"Cycle from 5.5 to 200 Hz at 1.5 g input at a sweep rate of 5 minutes from minimum to maximum frequency. The total test time will be 30 minutes based on 2000 miles of truck transportation. Dwell time at each resonance (up to a maximum of 4 in each axis) will be 5 minutes which is 1/6 the total test time."

The air conditioner and test fixture were rigidly mounted to the C210 vibration exciter as shown on pages 4 through 6 of Inclosure 2. Input accelerometers were located on the test fixture adjacent to the air conditioner mounting points.

Response accelerometers were mounted as illustrated on pages 7 through 9 of Inclosure 2.

The vibration test in each plane consisted of a resonance search, resonance dwells, and a cycling phase. The resonance searches from 5.5 to 200 Hz at 1.5 g input were made during the first sweep of each cycling phase.

Visual inspections for damage were made after testing in each plane. An operational test was performed following the vibration test.

15.4 Results

The frequencies of the major resonances as determined by a precise search at a low g input, and the input amplification factor Q were as shown in Table 15-I.

Table 15-I. Resonant Frequencies and Input Amplification Factors

Plane of Vibration	Resonant Frequency, Hz	Amplification Factor (Q)[a] at Locations							
		19[b]	17	18	20	21	22	23	24
Vertical	99	1	6.3	2.6	10.3	-	-	5.4	2.9
Longitudinal	74	1	4.5	8.0	-	4.9	-	4.0	8.1
	84	1	6.8	[illegible]4	-	3.3	-	4.7	3.8
	121	1	-	-	2.3	14.3	-	5.4	5.6
Transverse	43	1	6.1	2.3	16.9	2.2	-	-	12.5
	79	1	8.8	17.3	30.2	3.9	-	-	13.9

[a]Amplification Factor Q = $\frac{\text{Response g level}}{\text{Input g level}}$

Any Q of less than 2.0 was not reported.

[b]Input g level = 1.5 g + 10%.

Damage to the air conditioner occurred only during testing in the vertical plane. The damage was as follows:

a. A broken welded joint at the junction where the refrigerant line from the charge valve connected to the suction line of the compressor (see page 10 of Inclosure 2). This resulted in a complete loss of refrigerant.

b. The evaporator and condenser filter-clean-indicators broke free of their respective cover panels (see page 10 of Inclosure 2).

The air conditioner was repaired and operated. No further defects were found.

Operational characteristics of the air conditioner after vibration were as shown in Table 15-II.

Table 15-II. Post-Vibration Test Operational Characteristics, Unit No. 0157

	Modes of Operation	
	Cooling	Heating
Input, volts		
Phase A to neutral	240	240
Phase B to neutral	240	240
Phase C to neutral	240	240

Table 15-II (Cont'd)

	Modes of Operation	
	Cooling	Heating
Current, amperes		
Phase A	17.3	17.4
Phase B	17.3	17.4
Phase C	16.8	17.4
Power, kw		
Phase A	3.1	4.2
Phase B	3.1	4.2
Phase C	3.1	-
Power factor, %	75.6	-
Evaporator air intake temperature, °F	75	70
Evaporator air discharge temperature, °F	48	118
Refrigerant sight glass	Clear	-

15.5 Analysis

Except for the broken welded joint of the refrigerant line and the broken filter-clean-indicators, the test item met the vibration test criteria.

Examination of the broken weld, at the junction of the compressor suction and charge valve refrigerant lines, showed that the weld vibrated loose from the interior of the suction-line standoff fitting. This condition is believed to be a result of improper welding procedures. Greater quality control measures should be taken in this area.

Regarding mounting of the filter-clean-indicators, rivets or screws should be used in place of adhesives.

16. ENDURANCE TEST

16.1 Objective

The objective was to determine if the test item would operate satisfactorily for 500 hours without incurring damage.

16.2 Criteria

Any one of the following shall constitute failure of this test:

a. Failure of any component or fracture or breakdown of any material.

b. Evidence of refrigerant leaks.

c. Need for any servicing of the air conditioner during operation.

d. Abnormal operation.

e. Air temperature drop less than 26°F between evaporator inlet and outlet.

f. Current drawn on cooling cycle more than 12 kw with a power factor of at least 0.75.

g. Current drawn on heating cycle not between 19 and 21 amperes (average of three phases).

16.3 Method

This test was conducted on unit No. 0157.

The test was conducted in a shop area using the sheet metal ducts and thermocouples in the manner described in paragraph 2.3. With power connected to the test item through a test console, the test item was operated for 401 hours in the cooling mode in cyclic operation of 50 minutes ON and 10 minutes OFF. The test item was then operated for 104 hours in the heating mode in cyclic operation of 55 minutes ON and 5 minutes OFF. Cyclic operation was controlled by an electric timer which operated a contactor relay that was placed in the power line of the test item.

During the 505-hour operating period, the operational requirements were checked periodically in the following specified manner:

a. Observed the refrigerant sight glass to ascertain that the unit remained fully charged.

b. Examined the test item for evidence of abnormal operations.

c. Monitored evaporator intake- and discharge-air temperatures to ascertain that the intake-to-discharge temperature drop was at least 26°F.

d. Monitored input power parameters to ascertain that the power drawn in the cooling mode was less than 12 kw with a power factor of at least 0.75 and that the current drawn in the heating mode was between 19 and 21 amperes (average of three phases).

16.4 Results

The test item demonstrated satisfactory performance throughout the 505-hour endurance test run.

Operational characteristics recorded at the start and finish of the cooling and heating test phases are presented in Table 16-I.

Table 16-I. Endurance Test Operational Characteristics, Unit No. 0157

	Modes of Operation			
	Cooling		Heating	
	Start	Finish	Start	Finish
Input, volts				
Phase A to neutral	240	240	240	240
Phase B to neutral	240	240	240	240
Phase C to neutral	240	240	240	240
Current, amperes				
Phase A	17.3	17.5	17.4	17.4
Phase B	17.3	17.4	17.4	17.4
Phase C	16.8	17.0	17.4	17.5
Power, kw				
Phase A	3.1	3.1	4.2	4.2
Phase B	3.1	3.1	4.2	4.2
Phase C	3.1	3.1	4.2	4.3
Power factor, %	75.6	75.0	-	-
Evaporator air intake temperature, °F	75	76	70	66
Evaporator air discharge temperature, °F	48	48	118	117
Sight glass	Clear	Clear	-	-

16.5 Analysis

The test item met the endurance test criteria.

Although the current drawn in the heating mode measured 1.6 amperes (average of three phases) lower than the minimum requirement, based on the analysis of results obtained during the performance test (paragraph 3.5), the test item was considered to have met the endurance test criteria.

17. COOLING CAPACITY TEST

17.1 Objective

The objective is to determine if the test item would provide its rated cooling capacity.

17.2 Criterion

The unit will have a total (sensible plus latent) cooling capacity of 38,000 Btu/hr with the air entering the condenser at +120°F (dry bulb) and the air entering the evaporator at +90°F (dry bulb) and +75°F (wet bulb).

17.3 Method

This test was conducted on unit No. 0174.

The capacity test was conducted by Electrical Testing Laboratories, Inc., New York, N. Y., in accordance with ASHRAE Standard 37-60, Method of Testing for Rating Unitary Air Conditioning Equipment.

The test item was installed in a psychrometric test chamber and properly instrumented. The test item was installed flush with the "indoor"-barrier wall of the chamber, the fresh-air damper was fully closed and the thermostat set at maximum cooling. The capacity of the evaporator and condenser sides was measured by the air enthalpy method while the above criterion conditions were maintained.

17.4 Results

The measured total net cooling capacity was 43,130 Btu/hr. The data obtained from the capacity test are contained in Reference f.

Prior to shipping the test item to New York for the capacity [illegible], an operational checkout by USAMERDC personnel revealed that the [illegible] fuse of the unit blew each time an attempt was made to activate the unit. This fuse deactivates the dc control voltage circuits, thereby making the unit inoperative. Investigation showed that the refrigerant line solenoid valve was shorted internally, thereby reducing the coil resistance from 25 ohms to approximately 2 ohms. This decrease in coil resistance increased the average draw from a nominal 960 ma to 12 amperes, thereby blowing the 3/4-ampere protective line fuse. After replacing the solenoid valve no further problems were encountered in this area.

17.5 Analysis

The test item met the cooling capacity test criterion.

The total net cooling capacity of the test item exceeded the minimum specified requirement by 5130 Btu/hr.

Regarding the shorted coil of the solenoid valve, USAMERDC stated that this make and model valve has been used on all 38,000 and 50,000 Btu/hr air conditioners for approximately 7 years in both the HAWK and Pershing missile systems without a reported failure. Since the solenoid coil is impregnated for insulation, the shorted condition is believed to be a random failure.

TEST DATA

RADIO INTERFERENCE TEST DATA

Item: Air Conditioner 38,000 BTU/HR	Report No.: STEAP-MT-TF-183
Model: Part No 13216E0000	Specification: Mil-E-5400 (AS) Amend. 1
Serial No.: 0174	Engineer: R. C. Hizer
Mfr.:	Test Date: 29 August 1968
Location:	Test Area: Tracking Site
	Test Receiver: AN/URM-85 S/N 29

RADIATION - DB*

Freq Mhz	A	P	1	2	3	4	5	6	7	8
0.15										
0.35										
1.5	54	66	a	a						
3	55	66								
5	54	60								
8	53									
12	53									
16	45	↓								
20	35	54								
24	35									
28	29		↓							
30	28		32							
35	24		37							
38	27		a							
40	22									
45	26									
50	24		↓							
55	24		27							
60	23		a							
65	23									
70	25									
75	24									
80	24									
85	25									
90	26									
95	24									
100	23	↓	↓	↓						

Freq Mhz	A	P	1	2	3	4	5	6	7	8
110	24	54	a	a						
120	27	↓	↓	↓						
130	29									
140	32									
150	32									
160	33									
170	32									
180	33									
190	32									
200	37									
220	28									
240	23									
260	29									
280	36									
300	36									
350	23									
400	23									
450	26									
500	23									
550	27									
600	28									
650	26									
700	30									
750	31									
800	29									
850	32									
900	34									
950	34									
1000	39	↓	↓	↓						

A - AMBIENT NOISE LEVEL (Eng-Gen Running)
P - PASSING LIMIT
a - Interference noise level at or below ambient noise level.

Antenna 5 feet from front of unit

*Decibels above one microvolt per megahertz of bandwidth

1 - Cooling Mode
2 - Heating Mode

STEAP-DS Form 152a, 15 Oct 65
(Replaces STEAP-DS Form 152, 11 Feb 65)

RADIO INTERFERENCE TEST DATA

Item: Air Conditioner 36,000 BTU/HR	Report No.: STEAP-MT-TF-183
Model/Part No: 13216E0000	Specification: Mil-E-5534(EL) Amend. 1
Serial No.: 0174	Engineer: R.R. Newcomb
Mfr.:	Test Date: 5 September 1968
Location:	Test Area: Tracking Site
	Test Receiver: ANPURR-85 S/N 29

CONDUCTION - DB*

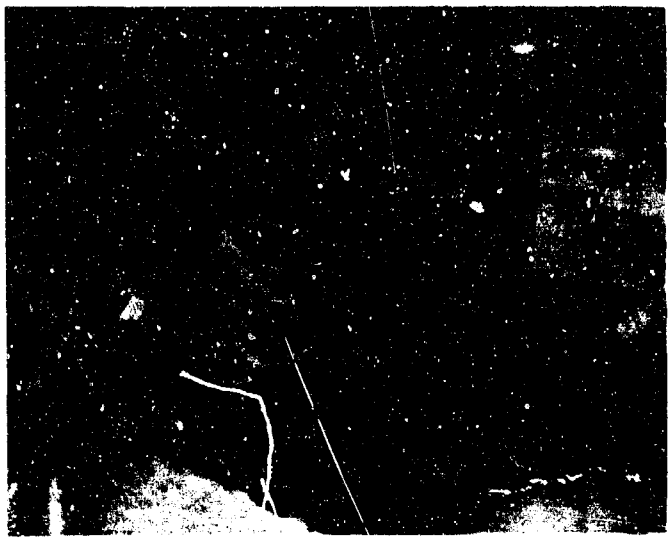
Freq. Mhz	A	P	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0.15																		
0.35																		
1.5	36	83	70	77	81	70	68	68	68	71								
3	39	83	51	65	58	65	44	59	46	63								
5	39	80	41	46	43	50	a	44	40	46								
8	37	80	39	a	39	38	40	39	39	38								
12	36	74	37	38	38	38	40	38	38	a								
16	35	↓	a	46	44	38	46	40	37	40								
20	35	↓	↓	38	38	38	38	36	36	38								
24	36	↓	↓	38	41	38	38	a	a	39								
28	36	↓	↓	38	42	37	38	37	↓	38								
30	36	↓	↓	40	38	38	38	38	↓	39								
35	31	↓	↓	a	a	a	a	a	↓	a								
38	31	↓	↓	↓	↓	↓	↓	↓	↓	↓								
40	32	↓	↓	↓	↓	↓	↓	↓	↓	↓								
45	33	↓	↓	↓	↓	↓	↓	↓	↓	↓								
50	33	↓	↓	↓	↓	↓	↓	↓	↓	↓								
55	33	↓	↓	↓	↓	↓	↓	↓	↓	↓								
60	32	↓	↓	↓	↓	↓	↓	↓	↓	↓								
65	32	↓	↓	↓	↓	↓	↓	↓	↓	↓								

A - AMBIENT NOISE LEVEL (Eng - Gen Running)
P - PASSING LIMIT
a - Interference noise level at or below ambient noise level.

Stabilization Networks and Ground Plane Used.

* Decibels above one microvolt per mega hertz of bandwidth.

1 - Ground Lead - Cooling Mode
2 - " " - Heating "
3 A Lead - Cooling Mode
4 " " - Heating "
5 - B Lead - Cooling Mode
6 - " " - Heating "
7 C Lead - Cooling Mode
8 " " - Heating "



V - Vertical Axis
L - Longitudinal Axis
T - Transverse Axis

Figure 1: Axes of Vibration.

Front and Left Side View

Front View

Front and Right Side View

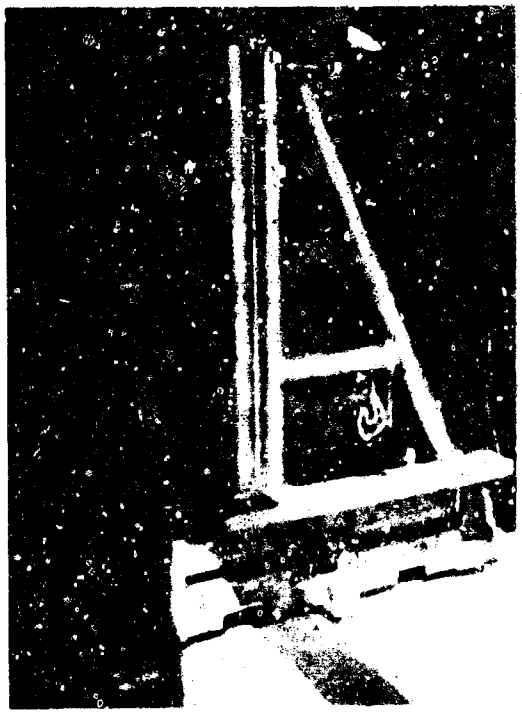
Figure 2: Mounted Test Item - Vertical Axis.

Front & Right Side View

Front View

Front and Left Side View

Figure 3: Mounted Test Item - Longitudinal Axis.



Front and Left Side View

Front and Right Side View

Figure 4: Mounted Test Item - Transverse Axis.

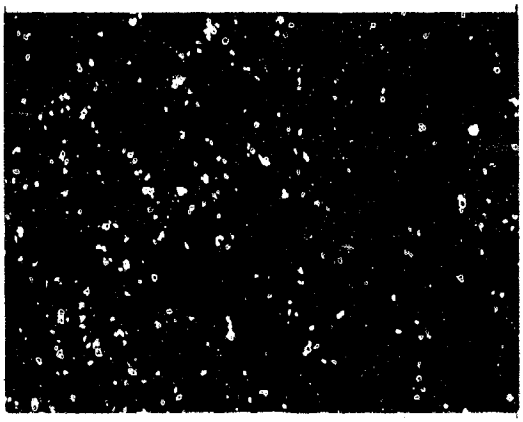


Figure - 1

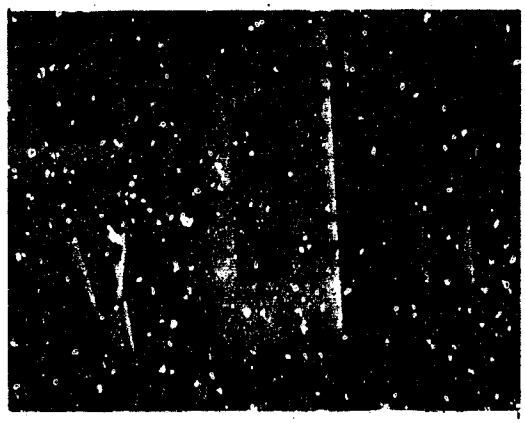


Figure - 2

Location

17 Center of right channel - bottom of air conditioner (not shown)
18 Center of left channel - bottom of air conditioner (not shown)
20 Top of Condenser blower motor (not shown)
21 Base of compressor motor (See Figure 1)
22 Base of Evaporator blower motor (not shown)
23 Inside Hi-Lo pressure control box - top of controls (See Figure 2)
24 Hi-Lo pressure control box mounting panel - longitudinal plane (See Figure 2)

Figure 5: Response Accelerometer Locations - Vertical Axis.

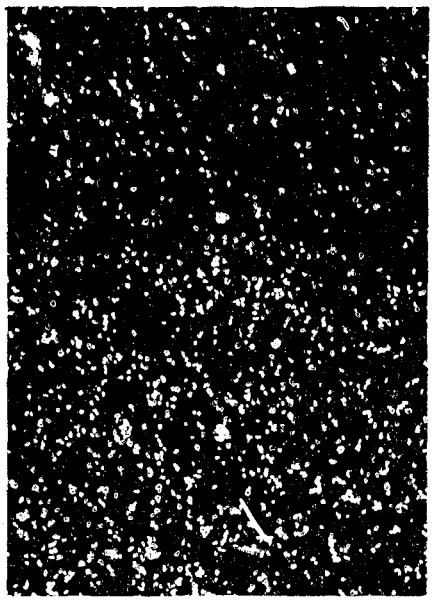


Figure 1

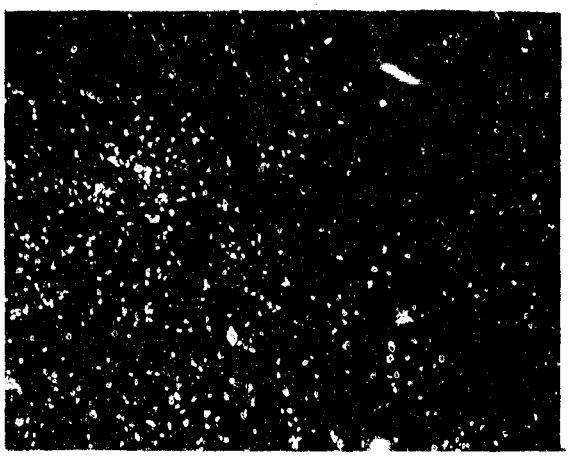


Figure 2

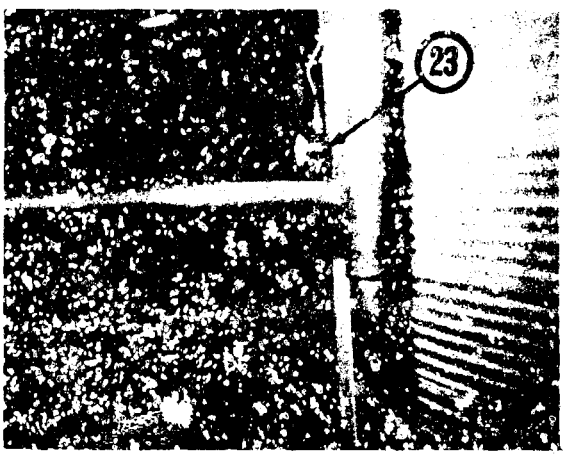


Figure 3

Location

17	Distributor lines tor of expansion valve (see Figure 1)
18	Mounting frame - evaporator coils (see Figure 1)
20	Compressor Unit (See Figure 2)
21	Side of Evaporator blower motor (not shown)
23	Mounting frame - condenser coils (see Figure 3)
24	Hi-Lo pressure control box mounting panel Same as Vert plane.

Figure 6: Response Accelerometer Locations - Longitudinal Axis.

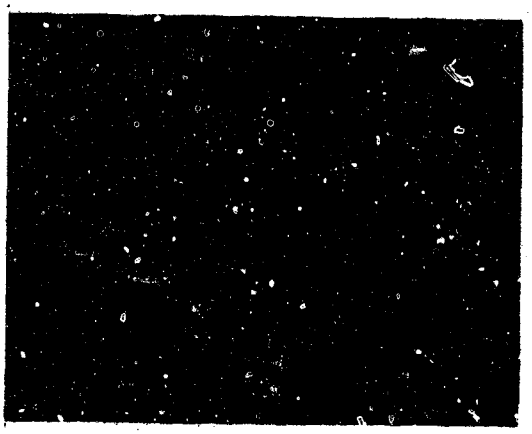


Figure 1

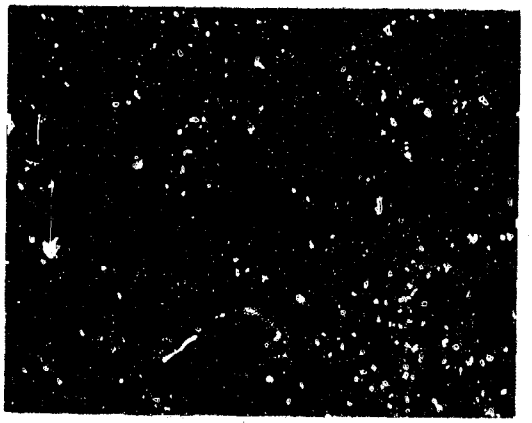


Figure 2

Locations

17	Feeder lines - evaporator section (see Figure 1)
18	Distribution lines - top of expansion valve (see Figure 1)
20	Compressor discharge line (see Figure 2)
21	End of Evaporator blower motor (not shown)
24	Feeder lines - condenser section (see Figure 2)

Figure 7: Response Accelerometer Locations - Transverse Axis.

Figure 1

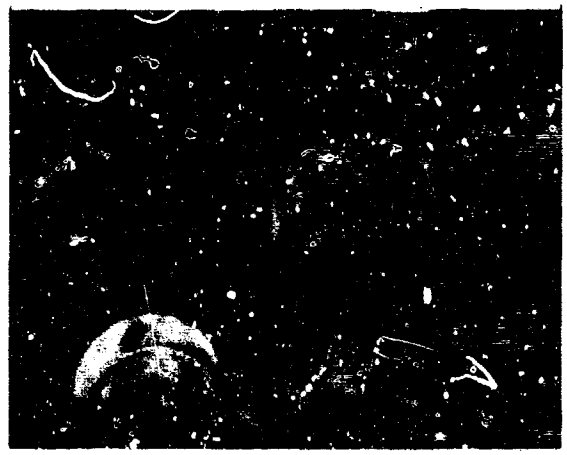


Figure 2

Damage

1. Refrigerant line which connects the charge valve to the compressor suction line broken at its soldered junction with the suction line.

2. Evaporator filter - clean indicator broken loose from its cemented position. Similar damage occurred to the condenser filter-clean indicator (not shown).

Figure 8: Damage that Occurred during Vibration in the Vertical Plane.

CORRESPONDENCE

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

AMSTE-GE
7-7-0831-02

8- 15 March 1967
1 MAR 1967

SUBJECT: Test Directive, USATECOM Project No. 7-7-0831-02, Initial Production Test of Air Conditioner, 38,000 BTU/HR, DA 23-195-AMC-01174(T), MIL-A-52195A, FSN 4120-926-4280

TO: Commanding Officer
Aberdeen Proving Ground
ATTN: STEAP-~~GE~~-P DTP'S
Aberdeen Proving Ground, Md. 21005

1. REFERENCES:

a. USAMEC letter file AMSME-QX, 23 January 1967, subject: "Request for Time and Cost Estimate of Air Conditioner, 38,000 BTU/HR, DA 23-195-AMC-01174(T), MIL-A-52195A, FSN 4120-926-4280, Initial Production Test," copy attached, inclosure 1.

b. AMCR 700-34.

c. USATECOM Regulation 705-2.

2. BACKGROUND: Not used.

3. DESCRIPTION OF MATERIEL: The test item is an air cooled environmental control unit designed for floor mounting. It utilizes Dichlorodifluoromethane refrigerant and is electric motor driven. Characteristics of the electric motor are 8.4 HP, AC, 416 Volts, and 3 Phase 400 Cycle. The unit has a rated cooling capacity of 38000 BTU/HR and a rated heating capacity of 35000 BTU/HR.

4. TEST OBJECTIVE:

a. To provide specified initial production test data on the air conditioner for the developer in conjunction with contractual requirements.

b. To provide the basis on which determination can be made by this headquarters as to suitability of the air conditioner for issue in accordance with the requirements of reference 1b.

SUBJECT: Test Directive, USATECOM Project No. 7-7-0831-02, Initial Production Test of Air Conditioner, 38,000 BTU/HR, DA 23-195-AMC-01174(T), MIL-A-52195A, FSN 4120-926-4280

5. RESPONSIBILITIES:

a. Commanding Officer, Aberdeen Proving Ground is responsible for:

(1) Providing USAMEC with time and cost estimates by 21 February 1967 as follows:

(a) For conduct of test services outlined in inclosure 2 to reference 1a:

1. On a routine basis utilizing:

a. One test unit.

b. A multiple number of test units.

2. On an expedited basis utilizing:

a. One test unit.

b. A multiple number of test units.

(b) Same as (a) above except that the test program to date will be reviewed and additional tests needed over and above those included in the outline, inclosure 2 to reference 1a to ensure compliance with the provisions of reference 1b will be considered in the estimates. The additional tests will be identified, and the methods and test criteria to be employed will be cited.

(2) Conducting the test when the funds and test item become available, in accordance with the test outline, inclosure 2 to reference 1a, on a routine basis and on one unit (Paragraph 5a(1)(a)1.a. above), unless directed otherwise by this headquarters prior to delivery of the test item, 1 April 1967.

(3) Submitting interim and final test reports directly to Commanding General, USAMEC with information copy to this headquarters. Special reporting and distribution instructions furnished in paragraph 9, reference 1a will be honored.

(4) Disposing of the test item in accordance with instructions made available by USAMEC.

b. Commanding General, U. S. Army Mobility Equipment Command is expected to:

(1) Provide the funds for the test.

(2) Effect delivery of the test item to Aberdeen Proving Ground by 1 April 1967.

(3) Furnish Aberdeen Proving Ground with any special reporting instructions considered necessary. These will be honored to the extent they do not conflict with the requirements and guidance contained in reference 1c.

(4) Furnish Aberdeen Proving Ground with disposition instructions on the test item.

6. COORDINATION: Not used.

7. SPECIAL INSTRUCTIONS:

a. Subject project number assigned this test will be referenced in all related correspondence.

b. Forwarded for information and retention, inclosure 2, is copy of the form required for entering this project in TSMS.

AMSTE-GE 1 MAR 1967
7-7-0831-02
SUBJECT: Test Directive, USATECOM Project No. 7-7-0831-02, Initial Production Test of Air Conditioner, 38,000 BTU/HR, DA 23-195-AMC-01174(T), MIL-A-52195A, FSN 4120-926-4280

c. Request USAMEC be advised when test item is delivered. Attention is invited to the possibility there may be items missing from the maintenance package. The source for such missing items will be as stated in paragraph 10, reference 1a.

8. TEST PLANS AND REPORTS:

a. Test Plans. No test plan is required for the test phases outlined in inclosure 2, reference 1a, since the procedures for these tests are considered standard. A test plan reflecting the requirements of paragraph 4b above is required by 15 March 1967.

b. Test Reports.

(1) An interim test report will be submitted to USAMEC within 15 days after test completion. A copy of the interim report will be provided this headquarters for information.

(2) A final test report will be submitted to USAMEC within 30 days after test completion. A copy of the final report will be provided this headquarters for information.

9. SAFETY: A safety release is hereby tendered provided all known safety precautions and instructions together with those found necessary in the test program to date are followed.

10. SECURITY: Unclassified.

FOR THE COMMANDER:

JAMES O. DAULTON
Colonel GS
Director, General Equipment
Testing Directorate

2 Incls
as Incl 2 4/cl

Copy furnished: (w/o incls)
CG, USAMEC, ATTN: AMSME-QX

3
page 4

DEPARTMENT OF THE ARMY Mr. Rich/jw/685-2145
U.S. ARMY MOBILITY EQUIPMENT COMMAND
4300 GOODFELLOW BOULEVARD
ST. LOUIS MISSOURI 63120

IN REPLY REFER TO:
AMSME-QX

23 January 1967

SUBJECT: Request for Time and Cost Estimate of Air Conditioner, 38,000 BTU/HR, DA 23-195-AMC-01174(T), MIL-A-52195A, FSN 4120-926-4280, Initial Production Test

TO: Commanding General
U. S. Army Test and Evaluation Command
ATTN: AMSTE-TA-M
Aberdeen Proving Ground, Maryland 21005

1. Request your Command schedule the following test for subject item and furnish this Directorate a time and cost estimate for conducting same.

TEST	NO. OF UNITS	REFERENCE
IPT	One (1)	Initial Production Test Plan, SMEFB-RDE-KC, 3 Jan 67

2. The subject items are manufactured by under contract number DA 23-195-AMC-01174(T), a copy of which is furnished herewith. Test item should arrive at test site about 1 April 1967.

3. REQUEST THAT AN ESTIMATE BE MADE ON EXPEDITED TESTING AS SUBJECT ITEM HAS BEEN ASSIGNED AN 02 PRIORITY AND IS IN SUPPORT OF SEA REQUIREMENTS.

4. If testing could be further expedited by utilizing more test units than stated above, base time and cost estimate on increased number of units.

5. This letter shall constitute authority to proceed with above-mentioned testing upon receipt of a fund citation.

6. It is requested that your office also include a time and cost estimate for conducting any other tests which are deemed necessary to ensure compliance with the provisions of AMCR 700-34. The estimate should include:

a. Identification of each additional test.

b. Test methods to be used and pass/fail criteria.

AMSME-QX 23 January 1967

SUBJECT: Request for Time and Cost Estimate of Air Conditioner, 38,000 BTU/HR, DA 23-195-AMC-01174(T), MIL-A-52195A, FSN 4120-926-4280, Initial Production Test

c. Justification for the inclusion of each test.

d. Time and cost required for each test.

7. An interim report upon conclusion of all tests specified in the contract will be required whenever additional testing has been authorized.

8. Request all estimates be furnished this Directorate COB 21 Feb 67.

9. Reports will be sent to:

a. USAMEC, ATTN: AMSME-QX, as follows:

(1) Equipment Failure Reports - 8 copies.

(2) Interim Reports - 8 copies.

(3) Final Reports - 8 copies.

b. USAERDL, ATTN: SMEFB-CO, as follows:

(1) Equipment Failure Reports - 4 copies.

(2) Interim Reports - 4 copies.

(3) Final Reports - 4 copies.

c. USATECOM will make distribution to all other interested activities.

10. Request this Directorate be notified upon receipt of test item at your Command. Any minor repair parts which may be necessary should be obtained locally, if possible. This would include spark plugs, air filters, hardware, etc. Major repair parts and minor parts not available locally should be obtained by contacting Mr. R. M. Rich at AUTOVON 685-2145. Your reply should include shipping instructions for test item.

FOR THE COMMANDER:

2 Incl w/d
1. Cy contract/as
2. Test Plan/as (dupe)

LEO W. BELLEVILLE
Acting Chief, Plans and Programs Office
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DEPARTMENT OF THE ARMY
HEADQUARTERS, U. S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

AMSTE-GE

16 MAR 1967

SUBJECT: USATECOM letter file AMSTE-GE, 1 March 1967, subject: "Test Directive, USATECOM Project No. 7-7-0831-02, Initial Production Test of Air Conditioner, 38,000 BTU/HR, DA-23-195-AMC-01174(T), MIL-A-52195A, FSN 4120-926-4280"

TO: Commanding Officer
Aberdeen Proving Ground
ATTN: STEAP-CO-P
Aberdeen Proving Ground, Md. 21005

1. Reference USAMEC letter AMSME-QA, 28 February 1967, subject: "Air Conditioner, 38000 BTU/HR," copy attached, inclosure 1.

2. Referenced letter requests deletion of paragraphs 6 and 7 of reference 1a, subject letter. Request the instructions in subject letter be amended to conform with the requested deletions.

FOR THE COMMANDER:

JAMES O. DAULTON
Colonel GS
Director, General Equipment
Testing Directorate

1 Incl w/d
as

Copy furnished: (w/o incl)
CG, USAMEC

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4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*
Final Letter Report 5 August 1968 to 13 May 1969

5. AUTHOR(S) *(First name, middle initial, last name)*
V. Morawski

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11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	USAMECOM

13. ABSTRACT

The initial production test of the 38,000 Btu/hr air conditioner was conducted at Aberdeen Proving Ground from 5 August 1968 to 13 May 1969 to determine conformance of the air conditioner to required performance characteristics. Fifteen individual deficiency and shortcoming incidents were discovered. It was concluded that the air conditioner did not completely meet the requirements established for the initial production test.

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Air conditioner 38,000 Btu/hr Electric motor-driven 416 volt 400 hertz						